



SIGNAL WARRANT ANALYSIS

PEDESTRIAN SIGNAL BETWEEN THE INTERSECTIONS OF CENTRAL AVENUE WITH CLOVER STREET AND RODGER AVENUE.

This Section presents the methodology and the analysis used to perform pedestrian signal warrant study at the Intersection of Central Avenue and Clover Street.

The signal warrant analysis is conducted using the procedures described in the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD 2008 Edition). According to the guidelines set forth in the MUTCD a total of eight (8) warrants needs to be analyzed, and a signal is warranted at an unsignalized location only if one or more of these warrants are satisfied.

The following sections discuss the methodology for the signal warrant analysis and present the results of the analysis using the Warrant 5 from the MUTCD manual.

Methodology

A signal warrant analysis requires a comprehensive investigation of traffic conditions and physical characteristics of the location to determine the necessity for a signal installation. For this purpose, data should be obtained by means of engineering studies and compared with the requirements set forth in the warrants discussed in the MUTCD. A traffic signal should not be installed unless one or more of the eight signal warrants are met. If these requirements are not met, a traffic signal should neither be put into operation nor continued in operation (if already installed). The following signal warrants are included:

- ✓ Warrant 1, Eight-Hour Vehicular Volume.
- ✓ Warrant 2, Four-Hour Vehicular Volume.
- ✓ Warrant 3, Peak Hour.
- ✓ Warrant 4, Pedestrian Volume.
- ✓ Warrant 5, School Crossing.
- ✓ Warrant 6, Coordinated Signal System.
- ✓ Warrant 7, Crash Experience.
- ✓ Warrant 8, Roadway Network

To determine the need of pedestrian signal at Central Avenue and Clover Avenue intersection, Warrant 5, for School Crossing was analyzed.



ANALYSIS:

An acceptable gap may be defined as the minimum time between vehicles that 85 percent of all groups of pedestrians waiting to cross a street will accept as adequate to cross the street, according to the Institute of Transportation Engineer's "School Trip Safety Program Guidelines."

- Width of the Central Avenue = 40 ft
- Walking Speed = 4 ft/sec.
- Adequate Gap Time to Cross the Central Avenue = 10 Sec.
- Number of Adequate Gaps as per ATR machines in an hour = 37
- Study Time Period = 60 minutes

This shows that an average 1 minute 40 seconds of waiting time needed to have an adequate gap of 10 seconds to cross the Central Avenue. In addition, there are total of 20 students crossing between 8:00 AM and 9:00 AM peak hour during the school days.

It should be noted generally, younger children need more assistance than older children because they have a more difficult time judging the speed and distance of approaching vehicles and may be tempted to cross during an unsafe gap.

Pedestrian counts and ATR data are provided in attached appendix.

REQUIREMENTS:

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

ANALYSIS:

School Advance Warning sign for school crossings, coupled with cross walk signs and cross walk markings are available between Clover Street and Belmar Terrace along Central which is currently considered to be the most common types of devices in use. These should be the first tools employed to improve safety at crossings directly associated with school children. Signs and roadway markings are intended to alert drivers to special locations designated for use by younger pedestrians. However, some drivers disregard such warnings and exceed the regular posted speed when traveling through a school zone and therefore NEW PEDESTRIAN SIGNAL at this location is worth to be considered for pedestrians' safety.

REQUIREMENT:

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.



ANALYSIS:

Within the study area the nearest distance to the traffic signal along the Central Avenue is approximately 2,261 feet.

CONCLUSION:

Based on above analysis, **School Crossing Warrant 5.0** is satisfied at Intersection of Central Avenue and Clover Street. The **INSTALLATION OF PEDESTRIAN SIGNAL** will certainly improve the safety of elementary school-age pedestrians, within the vicinity of the neighborhood.

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APPENDIX

**PEDESTRIAN AND AUTOMATIC TRAFFIC RECORDER
COUNTS**

Project: Central Avenue: Westfield
 Station: Westfield_1 Volume
 Location: Central Avenue
 City: Westfield, Union County, NJ

Start Time	11-Jun-Mon	Direction 1		Direction 2		Combined		12-Jun-Tue	Direction 1		Direction 2		Combined	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		50	252	11	127	61	379		48	266	27	140	75	406
12:15		43	275	17	131	60	406		47	301	10	128	57	429
12:30		32	248	18	161	50	409		30	290	7	123	37	413
12:45		31	303	11	133	42	436		20	277	6	153	26	430
01:00		14	341	7	121	21	462		25	252	11	154	36	406
01:15		21	285	5	141	26	426		18	267	2	159	20	426
01:30		30	228	7	134	37	362		12	268	6	146	18	414
01:45		16	291	4	140	20	431		14	279	9	132	23	411
02:00		6	253	5	146	11	399		0	237	7	145	7	382
02:15		9	281	4	135	13	416		13	267	4	154	17	421
02:30		11	270	5	102	16	372		13	261	9	163	22	424
02:45		11	262	4	128	15	390		8	252	5	137	13	389
03:00		8	282	6	148	14	430		10	278	6	123	16	401
03:15		6	237	6	157	12	394		13	256	3	150	16	406
03:30		9	260	3	143	12	403		8	268	7	171	15	439
03:45		7	313	4	178	11	491		9	315	4	174	13	489
04:00		10	260	3	170	13	430		8	266	6	181	14	447
04:15		6	264	11	160	17	424		10	278	4	190	14	468
04:30		16	293	7	167	23	460		13	314	7	184	20	498
04:45		15	252	12	173	27	425		27	313	10	165	37	478
05:00		24	294	20	169	44	463		17	288	12	166	29	454
05:15		27	330	27	185	54	515		30	314	31	151	61	465
05:30		56	298	50	190	106	488		32	339	32	165	64	504
05:45		72	381	50	141	122	522		76	306	53	172	129	478
06:00		91	314	59	172	150	486		94	379	67	157	161	536
06:15		126	303	76	153	202	456		125	313	81	156	206	489
06:30		163	319	90	133	253	452		138	283	102	167	240	450
06:45		208	324	81	129	289	453		173	320	83	168	256	488
07:00		229	356	125	117	354	473		256	307	121	153	377	460
07:15		352	285	127	134	479	419		368	271	127	177	495	448
07:30		297	247	150	125	447	372		331	230	150	154	481	384
07:45		368	234	134	127	502	361		382	264	132	154	514	418
08:00		284	244	147	112	431	356		329	236	172	118	501	354
08:15		282	249	166	123	448	372		296	217	152	112	448	329
08:30		241	238	126	96	367	334		253	225	126	82	379	307
08:45		251	248	149	86	400	334		320	204	159	96	479	300
09:00		284	176	147	113	431	289		288	190	143	99	431	289
09:15		225	190	146	79	371	269		232	196	135	81	367	277
09:30		252	162	116	76	368	238		274	189	135	82	409	271
09:45		197	167	142	64	339	231		271	181	125	82	396	263
10:00		264	146	126	56	390	202		259	124	131	65	390	189
10:15		239	145	110	43	349	188		259	136	135	72	394	208
10:30		284	105	120	41	404	146		281	142	113	57	394	199
10:45		238	90	111	53	349	143		261	118	137	35	398	153
11:00		283	84	107	39	390	123		232	98	125	47	357	145
11:15		291	55	126	33	417	88		233	94	129	23	362	117
11:30		248	55	132	21	380	76		242	93	135	33	377	126
11:45		271	47	138	27	409	74		301	77	114	25	415	102
Total		6498	11536	3248	5732	9746	17268		6699	11639	3307	6121	10006	17760
Day Total		18034		8980		27014			18338		9428		27766	
% Total		24.1%	42.7%	12.0%	21.2%				24.1%	41.9%	11.9%	22.0%		
Peak Vol.		07:15	05:15	07:30	04:45	07:15	05:15		07:15	05:15	08:00	03:45	07:15	05:30
P.H.F.		1301	1323	597	717	1859	2011		1410	1338	609	729	1991	1987
		0.884	0.868	0.899	0.943	0.926	0.963		0.923	0.883	0.885	0.959	0.968	0.927

Project: Central Avenue: Westfield
 Station: Westfield_1 Volume
 Location: Central Avenue
 City: Westfield, Union County, NJ

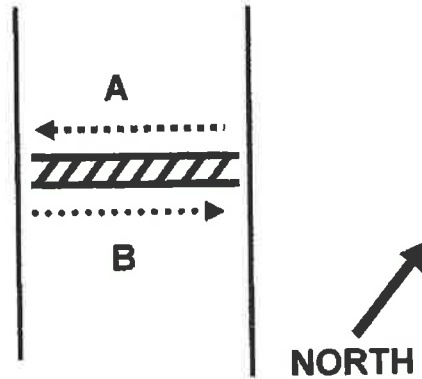
Start Time	13-Jun- Wed	Direction 1		Direction 2		Combined		14-Jun- Thu	Direction 1		Direction 2		Combined	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		59	306	27	133	86	439		66	274	25	146	91	420
12:15		26	299	18	120	44	419		53	308	17	130	70	438
12:30		44	292	23	134	67	426		44	265	21	160	65	425
12:45		46	310	20	139	66	449		48	274	14	150	62	424
01:00		24	276	12	136	36	412		32	300	10	130	42	430
01:15		16	277	8	144	24	421		23	258	13	162	36	420
01:30		26	282	13	131	39	413		19	.	6	.	25	.
01:45		17	264	6	135	23	399		16	.	8	.	24	.
02:00		10	271	6	135	16	406		9	.	10	.	19	.
02:15		23	273	5	138	28	411		17	.	7	.	24	.
02:30		9	243	7	145	16	388		10	.	4	.	14	.
02:45		9	260	3	155	12	415		18	.	4	.	22	.
03:00		11	284	3	132	14	416		6	.	9	.	15	.
03:15		8	238	7	167	15	405		10	.	5	.	15	.
03:30		10	254	5	165	15	419		6	.	6	.	12	.
03:45		1	265	2	171	3	436		5	.	2	.	7	.
04:00		6	304	4	150	10	454		4	.	7	.	11	.
04:15		16	260	6	166	22	416		9	.	4	.	13	.
04:30		8	293	5	179	13	472		17	.	7	.	24	.
04:45		22	280	14	174	36	454		26	.	9	.	35	.
05:00		24	278	21	187	45	465		18	.	13	.	31	.
05:15		32	261	26	183	58	444		30	.	25	.	55	.
05:30		43	300	42	163	85	463		48	.	39	.	87	.
05:45		79	317	44	142	123	459		59	.	51	.	110	.
06:00		71	324	61	159	132	483		88	.	60	.	148	.
06:15		150	326	80	176	230	502		113	.	81	.	194	.
06:30		192	327	75	161	267	488		182	.	97	.	279	.
06:45		202	350	107	142	309	492		244	.	84	.	328	.
07:00		294	249	107	140	401	389		252	.	113	.	365	.
07:15		327	302	133	146	460	448		339	.	136	.	475	.
07:30		359	242	140	146	499	388		341	.	124	.	465	.
07:45		364	285	163	121	527	406		398	.	124	.	522	.
08:00		333	201	166	109	499	310		300	.	166	.	466	.
08:15		313	226	172	97	485	323		251	.	171	.	422	.
08:30		306	218	146	97	452	315		294	.	136	.	430	.
08:45		296	199	163	90	459	289		270	.	176	.	446	.
09:00		240	166	160	102	400	268		269	.	130	.	399	.
09:15		282	231	145	91	407	322		291	.	127	.	418	.
09:30		258	220	113	72	371	292		290	.	146	.	436	.
09:45		296	164	127	99	423	263		290	.	128	.	418	.
10:00		241	141	115	69	356	210		252	.	132	.	384	.
10:15		283	166	109	65	392	231		256	.	123	.	379	.
10:30		310	116	101	48	411	164		256	.	115	.	371	.
10:45		251	113	128	31	379	144		281	.	129	.	410	.
11:00		253	128	142	37	395	165		297	.	118	.	415	.
11:15		271	71	143	35	414	106		271	.	119	.	390	.
11:30		277	67	123	30	400	97		280	.	136	.	416	.
11:45		203	49	144	30	347	79		252	.	118	.	370	.
Total		6921	11568	3390	5907	10311	17475		6950	1679	3305	878	10255	2557
Day Total		18489		9297		27786			8629		4183		12812	
% Total		24.9%	41.6%	12.2%	21.3%				54.2%	13.1%	25.8%	6.9%		
Peak Vol.		1383	1327	647	723	2010	1965		1378	1147	649	602	1928	1717
P.H.F.		0.950	0.948	0.940	0.967	0.954	0.979		0.866	0.931	0.922	0.929	0.923	0.980

ADT Not Calculated

Project: Central Avenue: Westfield
 Station: Westfield_1 Volume
 Location: Central Avenue
 City: Westfield, Union County, NJ

Start Time	09-Jun-Sat	Direction 1		Direction 2		Combined		10-Jun-Sun	Direction 1		Direction 2		Combined	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		102	279	49	170	151	449		112	258	39	145	151	403
12:15		88	304	34	164	122	468		97	206	28	135	125	341
12:30		88	270	48	168	136	438		115	312	48	137	163	449
12:45		70	267	42	163	112	430		70	310	33	133	103	443
01:00		50	316	20	154	70	470		54	276	12	167	66	443
01:15		49	246	26	133	75	379		50	283	14	126	64	409
01:30		39	271	15	145	54	416		56	288	20	120	76	408
01:45		42	284	16	154	58	438		33	298	19	113	52	411
02:00		28	281	22	139	50	420		46	254	16	124	62	378
02:15		24	279	10	163	34	442		32	211	14	160	46	371
02:30		30	305	9	148	39	453		37	310	7	140	44	450
02:45		28	280	8	152	36	432		38	341	5	120	43	461
03:00		16	290	12	154	28	444		12	221	8	131	20	352
03:15		31	281	5	143	36	424		23	310	8	113	31	423
03:30		22	267	4	137	26	404		32	330	3	146	35	476
03:45		9	267	6	159	15	426		14	249	6	131	20	380
04:00		5	295	7	129	12	424		7	267	12	132	19	399
04:15		18	251	2	158	20	409		21	273	2	130	23	403
04:30		12	245	10	167	22	412		13	262	1	112	14	374
04:45		14	302	8	148	22	450		20	298	13	130	33	428
05:00		17	267	9	175	26	442		10	313	5	120	15	433
05:15		29	273	17	145	46	418		18	270	10	110	28	380
05:30		22	279	19	152	41	431		23	242	11	130	34	372
05:45		46	277	16	126	62	403		25	271	13	120	38	391
06:00		25	276	21	112	46	388		16	246	15	114	31	360
06:15		43	281	27	132	70	413		22	245	25	123	47	368
06:30		84	265	37	133	121	398		35	255	32	106	67	361
06:45		98	283	46	122	144	405		38	256	50	99	88	355
07:00		83	257	55	118	138	375		50	267	30	113	80	380
07:15		126	302	54	142	180	444		57	280	39	115	96	395
07:30		135	257	73	127	208	384		51	224	44	109	95	333
07:45		175	251	77	106	252	357		87	247	39	96	126	343
08:00		167	209	82	110	249	319		121	234	48	109	169	343
08:15		215	217	97	118	312	335		64	222	59	92	123	314
08:30		238	181	109	113	347	294		104	186	80	99	184	285
08:45		239	208	116	110	355	318		147	196	70	89	217	285
09:00		282	224	110	104	392	328		134	220	72	71	206	291
09:15		224	208	138	102	362	310		168	165	85	67	253	232
09:30		219	210	158	103	377	313		230	142	95	62	325	204
09:45		297	183	145	93	442	276		267	118	87	57	354	175
10:00		296	223	144	100	440	323		247	112	104	43	351	155
10:15		232	191	164	92	396	283		216	101	99	55	315	156
10:30		255	159	175	103	430	262		174	115	130	45	304	160
10:45		277	142	154	77	431	219		234	84	118	46	352	130
11:00		295	141	142	83	437	224		238	98	133	39	371	137
11:15		300	112	169	74	469	186		224	103	118	29	342	132
11:30		268	105	145	58	413	163		236	64	125	27	361	91
11:45		306	116	150	45	456	161		316	54	123	23	439	77
Total		5758	11677	3002	6123	8760	17800		4434	10887	2167	4953	6601	15840
Day Total		17435		9125		26560			15321		7120		22441	
% Total		21.7%	44.0%	11.3%	23.1%				19.8%	48.5%	9.7%	22.1%		
Peak		11:00	00:15	10:30	12:00	11:00	00:15		11:00	02:45	10:30	00:15	11:00	00:30
Vol.		1169	1157	640	665	1775	1806		1014	1202	499	572	1513	1744
P.H.F.		0.955	0.915	0.914	0.978	0.946	0.961		0.802	0.881	0.938	0.856	0.862	0.971

STATION: CP 219 Westfield-Ped 1
 N/S ROUTE: Central Avenue
 E/W ROUTE:
 MUNICIPALITY: Westfield Town
 COUNTY: Union
 DATE: June 7-8, 2007
 DAY OF WEEK: Thursday - Friday
 TIME: 7:30-9:30AM - 2:30-6:30PM
 TEMPERATURE: High 70s
 WEATHER: Clear - Nice
 ENUMERATOR: PDH



15 MINUTE INTERVAL PEDESTRIAN COUNT

START TIME	A	B	C	D
7:30	0	0		
7:45	1	1		
Hour Total	1	1	0	0
8:00	2	0		
8:15	8	0		
8:30	5	1		
8:45	2	1		
Hour Total	17	3	0	0
9:00	0	0		
9:15	1	2		
Hour Total	1	2	0	0
14:30	1	1		
14:45	0	0		
Hour Total	1	1	0	0

START TIME	A	B	C	D
15:00	0	1		
15:15	0	8		
15:30	0	1		
15:45	1	0		
Hour Total	1	10	0	0
16:00	2	0		
16:15	0	0		
16:30	0	0		
16:45	0	1		
Hour Total	2	1	0	0
17:00	2	2		
17:15	1	5		
17:30	1	2		
17:45	3	0		
Hour Total	7	9	0	0
Daily Total	30	27		